

CLAIMS

1. **Apparatus adapted for use to reference a cam actuatable switch or the like means to the disposition of a drive in a datum range** (e.g.; the movement of a member between open and closed conditions under the action of the drive), said apparatus having,
 - dependent on the drive, an eccentric member,
 - a spur gear carried by yet free to rotate relative to the eccentric member,
 - a ring gear with its inwardly directed teeth in an epicyclic meshing relationship with the spur gear, and
 - a cam (or other datum providing interactive means component) ["cam"] rotatable with the spur gear adapted to interact, intended, capable of or suitable for being adapted to interact with a switch or the like means,

wherein there is an adaption or a capability whereby both any such switch or the like means (save for its switch activation movement, if any) is or can be in a substantially fixed relationship with said ring gear when in use.
2. Apparatus of claim 1 wherein the drive is rotatable on a rotation axis about which the eccentric member orbits.
3. Apparatus of claim 1 or 2 wherein said ring gear includes means to index into an appropriately provided mount which also serves at least in part as a mount for a switch or the like means to be actuated by the cam.
4. Apparatus of any one of the preceding claims wherein the cam is mounted from a member rotatable with a member slidably encompassing the ring gear but which itself is indexable to rotate about the rotation axis under the action of the eccentrically carried spur gear.
5. Apparatus of any one of the preceding claims wherein there is a differential in teeth numbers between the spur gear and the ring gear.
6. Apparatus of claim 5 wherein the differential is a low integer.
7. Apparatus of claim 6 wherein one or two.
8. Apparatus of any one of claims 5 to 7 wherein the teeth number differential is such as to provide a reduction drive from the rotatable drive which carries the eccentric member through to the cam which rotates about the same said rotation axis.

9. Apparatus of any one of the preceding claims wherein the eccentric member dependent on the drive is eccentrically extending from a moulded member which includes a worm gear adapted to be driven by a worm.

10. Apparatus of claim 9 wherein said moulded member additionally includes
5 spline or other means adapted to engage a drive, sprocket, pulley, gear or the like adapted to open and/or close a door or the like (such as a garage door).

11. Apparatus of claim 9 or 10 wherein the moulded member is a moulded member of the kind defined and preferably one mounted as described in New Zealand Patent Specification No. 522300.

10 12. **Apparatus adapted to rotate a cam** (or other datum providing interactive means component) ["cam"] about a rotation axis, said apparatus having,

dependent on a rotatable drive on said rotation axis, an eccentric member to orbit the rotation axis,

a spur gear carried by yet free to rotate relative to the eccentric member,

15 a ring gear with its inwardly directed teeth in an epicyclic meshing relationship with the spur gear yet fixed relative to and so as not to rotate about the rotation axis, and

a cam rotatable about the rotation axis under the action of the spur gear,

(and optionally and preferably) a mounting for or fixed in respect of

20 (iv) the rotational axis of said drive on which the eccentric member is dependent and

(v) the ring gear.

13. Apparatus of claim 12 wherein said ring gear includes means to index into an appropriately provided mount which also serves at least in part as a mount for a switch
25 or the like means to be actuated by the cam.

14. Apparatus of claim 13 or 14 wherein the cam is mounted from a member rotatable with a member slidably encompassing the ring gear but which itself is indexable to rotate about the rotation axis under the action of the eccentrically carried spur gear.

30 15. Apparatus of any one of claims 12 to 14 wherein there is a differential in teeth numbers between the spur gear and the ring gear.

16. Apparatus of claim 15 wherein the differential is a low integer.
17. Apparatus of claim 16 wherein the differential is one or two.
18. Apparatus of any one of claims 15 to 17 wherein the teeth number differential is such as to provide a reduction drive from the rotatable drive which carries the
5 eccentric member through to the cam which rotates about the same said rotation axis.
19. Apparatus of any one of claims 15 to 18 wherein the eccentric drive is eccentrically extending from a moulded member which includes a worm gear adapted to be driven by a worm.
20. Apparatus of any one of claims 15 to 19 wherein said moulded member
10 additionally includes spline or other means adapted to engage a drive, sprocket, pulley, gear or the like adapted to open and/or close a door or the like (such as a garage door).
21. Apparatus of any one of claims 15 to 20 wherein the moulded member is a moulded member of the kind defined and preferably one mounted as described in New Zealand Patent Specification No. 522300.
- 15 22. **Apparatus adapted to rotate a cam** (or other datum providing interactive means component) ["cam"], said apparatus having,
 dependent on a rotatable drive, a rotatable drive axis orbiting eccentric member,
 a spur gear carried by yet free to rotate relative to the eccentric member,
 a ring gear with its inwardly directed teeth in an epicyclic meshing relationship
 20 with the spur gear,
 a cam rotatable about the rotation axis under the action of the spur gear, and
 a mounting for or fixed in respect of
 (i) the rotational axis of said drive on which the eccentric member is
 dependent, and
 25 (ii) the ring gear.
23. Apparatus of claim 22 wherein said ring gear includes means to index into an appropriately provided mount which also serves at least in part as a mount for a switch or the like means to be actuated by the cam.
24. Apparatus of claims 22 or 23 wherein the cam is mounted from a member
30 rotatable with a member slidingly encompassing the ring gear but which itself is

indexable to rotate about the rotation axis under the action of the eccentrically carried spur gear.

25. Apparatus of any one of claims 22 to 24 wherein there is a differential in teeth numbers between the spur gear and the ring gear.

5 26. Apparatus of claim 25 wherein the differential is a low integer.

27. Apparatus of claim 26 wherein the differential is one or two.

28. Apparatus of any one of claims 25 to 27 wherein the teeth number differential is such as to provide a reduction drive from the rotatable drive which carries the eccentric member through to the cam which rotates about the same said rotation axis.

10 29. Apparatus of any one of claims 22 to 28 wherein the eccentric drive is eccentrically extending from a moulded member which includes a worm gear adapted to be driven by a worm.

30. Apparatus of claim 29 wherein said moulded member additionally includes spline or other means adapted to engage a drive, sprocket, pulley, gear or the like
15 adapted to open and/or close a door or the like (such as a garage door).

31. Apparatus of any one of claims 22 to 30 wherein the moulded member is a moulded member of the kind defined and mounted substantially as described in New Zealand Patent Specification No. 522300.

32. **Apparatus for providing a physical reference or datum between a rotatable**
20 **drive to operate over a datum range of multiple rotation(s)**, said apparatus having said rotatable drive drivingly rotatable directly or indirectly under the action of an electric motor about a rotation axis, an eccentric member carried by the rotatable drive so as to orbit the rotational axis thereof as the rotatable drive rotates,

a spur gear carried by yet free to rotate relative to the eccentric member,

25 a ring gear with its inwardly directed teeth in an epicyclic meshing relationship with the spur gear,

a cam (or other datum providing interactive means component) ["cam"] rotatable about the rotation axis under the action of the spur gear,

a switch actuable by the cam in a condition that references the rotatable drive to
30 the datum range of rotation(s), whereby in use the switch is in a fixed angular disposition about the rotational axis as is also the ring gear.

33. The apparatus is apparatus also as otherwise defined herein.
34. **A method of limiting a rotatable drive** which employs the operative use of apparatus of any of the forms herein before described.
35. **A limit system** which limits the rotation of a rotational drive, whereby the
5 rotational drive is referenced by electronic means to a physical datum or reference between the rotational drive and a switch to which the electronic means references thereby, by reference to actuation and/or non actuation, or both, of the switch of determining whether or not a or one of the limits has been reached.
36. A limit system of claim 35 for a door, window or the like closing system.
- 10 37. A limit system of claim 35 or 36 wherein the mode of operation is substantially as herein described with reference to Figure 12 of the accompanying drawings (irrespective of whether or not it uses apparatus herein described with reference to Figures 1 to 11 of the accompanying drawings).
38. A method of limit control substantially as herein described with reference to
15 Figure 12 of the accompanying drawings.
39. **A limit protocol** for a door opening system where a physical switch or the like established datum ancillary to the drive system for door opening/closing is utilised to establish a drive operation range of the drive system extending to either side of the datum.
- 20 40. A protocol of claim 39 wherein the datum is established reliant upon a physical interaction of a epicyclic including transmission ancillary to the drive but receiving input directly or indirectly of the drive.
41. A protocol of claim 40 wherein the input is through an accentric input.